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ABSTRACT

This publication is the examination booklet used for a home study course in water treatment. This course is the intermediate part of a series produced by the Department of the Navy. This publication is designed to be used in conjunction with a textbook. Each of the two examinations contained in this document are referenced to a section of the text. The first examination contains 40 questions and the second contains 45 questions. All of the questions are multiple choice and are cognitive type questions with a few problem solving type questions. Many of the questions relate to hydrology and water treatment physics as well as water treatment equipment usage. (MR)

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NAVFAC P-334

NTTC COURSE 215

INTERMEDIATE WATER EXAMINATION

Prepared by

NAVFAC TECHNICAL TRAINING CENTER
NAVY PUBLIC WORKS CENTER
NORFOLK, VIRGINIA 23511

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
Washington, D. C. 20390

SE 023 888

NTTC COURSE 215

INTERMEDIATE WATER

Prepared Under the Supervision of the
Naval Facilities Engineering Command

Administered by the NavFac Technical Training Center

This home study course consists of this examination booklet (including answer sheets) and a textbook.

TO GET THE MOST OUT OF THIS COURSE -

If there is an errata sheet included with this course make all indicated changes and corrections in the examination booklet and the textbook.

Study those pages of the textbook listed for each examination. Pay particular attention to the illustrations, as they give a lot of information in a small space.

If the textbook contains a quiz at the end of each chapter and a review quiz at the end of the textbook, work them and check your answers with the correct ones at the end of the book.

When you have finished the required readings for an assignment, answer the questions in the examination booklet. Do not mark your answers in the examination booklet, use your answer sheet. Read each item carefully. Consult your textbook to help you select the best answer. You may discuss difficult points in the course with your supervisor. However, the answer that you select must be your own. Mark your answer in the answer sheet provided.

You may find that some of the text content has become obsolete since the text was written. However, since the course is based on the textbook, in answering items be sure to select the best answer from the information in the textbook. The obsolete matter in the textbook will be brought up to date when the text is revised.

Use a separate answer sheet for each examination and be sure that for each question you fill in only that space that corresponds in number and answer to that of the examination booklet. If you decide to change an answer be sure to erase the old answer completely. Do not cross it out.

Follow all directions printed on the answer sheet. Be sure to supply all the information requested.

You must attain an average grade of at least 3.2 to complete this course successfully.

I

NOTE: EXAMINATION QUESTIONS MUST BE RETURNED WITH FINAL ANSWER SHEET. NO GRADE OR CERTIFICATE WILL BE ISSUED UNTIL EXAMINATION QUESTIONS ARE RETURNED. TEXTBOOKS MAY BE KEPT.

Mail each answer sheet as soon as you have finished marking it. The answer sheets will be returned to you after grading. Incorrect answers will be marked with the page number in the textbook where the correct answer can be found.

When you have completed the course and examination questions have been returned you will receive formal notification of your final grade for the course.

The NavFac Technical Training Center will provide envelopes in which to mail your completed assignments and return your examination questions.

Be sure you check the examples shown on the following page for the correct method of filling in answer sheets.

Home study courses may include a variety of items -- multiple-choice, true-false, matching, etc. The items are not grouped by type; regardless of type, they are presented in the same general sequence as the textbook material upon which they are based. This presentation is designed to preserve continuity of thought, permitting step-by-step development of ideas. Some courses use many types of items; others only a few. The student can readily identify the type of each item (and the action required of him) through inspection of the samples given below.

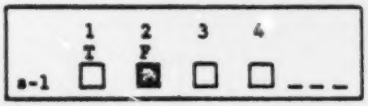
MULTIPLE-CHOICE ITEMS

Each item contains several alternatives, one of which provides the best answer to the item. Select the best alternative, and blacken the appropriate box on the answer sheet.

SAMPLE

s-1. The first person to be appointed Secretary of Defense under the National Security Act of 1947 was
1. George Marshall
2. James Forrestal
3. Chester Nimitz
4. William Halsey

Indicate in this way on the answer sheet:



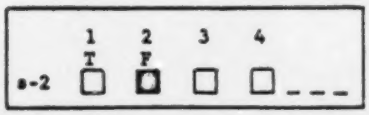
TRUE-FALSE ITEMS

Mark each statement true or false as indicated below. If any part of the statement is false the statement is to be considered false. Make the decision, and blacken the appropriate box on the answer sheet.

SAMPLE

s-2. Any naval officer is authorized to correspond officially with a bureau of the Navy Department without his commanding officer's endorsement.

Indicate in this way on the answer sheet:



MATCHING ITEMS

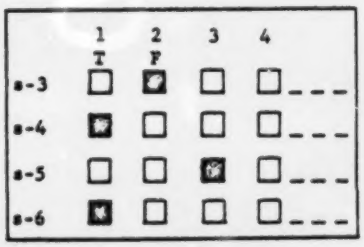
Each set of items consists of two columns, each listing words, phrases or sentences. The task is to select the item in column B which is the best match for the item in column A that is being considered. Specific instructions are given with each set of items. Select the numbers identifying the answers and blacken the appropriate boxes on the answer sheet.

SAMPLE

In items s-3 through s-6, match the name of the shipboard officer in column A by selecting from column B the name of the department in which the officer functions.

A	B
s-3. Damage Control Assistant	1. Operations Department
s-4. CIC Officer	2. Engineering Department
s-5. Assistant for Disbursing	3. Supply Department
s-6. Communications Officer	

Indicate in this way on the answer sheet:



NTTC CRS 215

Intermediate Water

EXAMINATION 1

Textbook Assignment: Chapters 1 and 2

---

1. If the safe water supply is limited, a salt or high mineral content water supply may be used for

   a. make-up water for boilers
   b. fire protection
   c. lawn sprinkling
   d. diluting chemicals

2. The longer water stays in contact with a substance the

   a. higher the concentration of the substance in the water
   b. lower the concentration of the substance in the water
   c. proportion will stay the same
   d. weaker the water will become

3. Physical standards for water state that color shall not exceed

   a. 10 ppm
   b. 30 ppm
   c. 15 ppm
   d. 20 ppm

4. The effective way to remove turbidity is by

   a. evaporation
   b. water flowing over earth
   c. coagulation, settling and filtration
   d. cooling

5. The water with the most taste and odor is

   a. warm surface water
   b. cold water
   c. distilled water
   d. filtered water

6. Total solids in water of a good chemical quality should not exceed

a. 1000 ppm
b. 500 ppm
c. 756 ppm
d. 600 ppm

7. Calcium carbonate produces

a. acidity in water
b. a black color
c. softness in water
d. hardness in water

8. Calcium bicarbonate may be found in regions containing

a. magnesium
b. iron
c. limestone
d. algae

9. In steam boilers the heat changes calcium chloride into

a. an acid
b. a base
c. lime
d. ash

10. Large amounts of sodium sulfate will cause

a. a red color in water
b. foaming in boilers
c. turbidity
d. a stale taste

11. Red water is caused by the oxidation of

a. pathogenic bacteria
b. rust
c. iron
d. Crenothrix bacteria

12. A highly cumulative poison in water is

a. lead
b. copper
c. fluorine
d. zinc

13. Mottling of tooth enamel is cau

    a. copper
    b. fluorides
    c. iron
    d. lead

14. The amount of dissolved oxygen in surface wat
    amount of

    a. carbon dioxide
    b. heat energy present
    c. acid
    d. pollution and algae

15. Hydrogen sulfide is formed whe.. organic matter contacts
    minerals containing

    a. sulfates
    b. water
    c. carbon dioxide
    d. hydrochloric acid

16. The facilities of a waterworks system

    a. are the same in all plants
    b. vary considerably according to sources and treatment
       requirements
    c. vary according to population
    d. must be kept up to date

17. Low lift pumps are used for pumping water to

    a. non-pressure or gravity flow treatment plants
    b. high-pressure tanks
    c. elevated storage tanks
    d. the distribution system

18. Booster stations are located

    a. in the middle of supply lines
    b. midway between pumping stations
    c. at or near the end of long supply lines where pressure
       is low
    d. on all distribution charts

19. An aerator removes

a. turbidity
b. total solids
c. dissolved gases
d. biological standards

20. In a direct-pressure distribution system, pressure is maintained by

a. elevated storage tanks
b. constant pump operation
c. a gravity flow tank over the system
d. special treatment

21. The major operating problems in concrete and masonry dams are

a. solar distillation
b. osmosis
c. leakage and ice
d. specially constructed systems

22. The best method of controlling silting is by

a. reducing erosion in the drainage area
b. removing vegetation in the area
c. providing catch basins for silt
d. dredging

23. Wells are classified in types according to

a. size
b. methods of construction
c. depth
d. location

24. A continuous stream of water under pressure is used in constructing a

a. dug well
b. bored well
c. drilled well
d. jetted well

25. A drive point enters directly into the water-bearing formation in a

a. driven well

b. bored well
c. jetted well
d. dug well

26. A simple test for the presence of water is to

a. observe the amount of vegetation
b. examine the clay
c. pour water into the well and note the water level
d. listen for sound of blow while driving well

27. When pumping sand from a well it is important to

a. keep the excess water away from the pump
b. maintain a rapid rate
c. note the water level before and after pumping
d. grade the sand particles by size

28. Wells in batteries with a single suction header should be at least

a. 30 feet apart
b. 42 feet apart
c. 25 feet apart
d. 20 feet apart

29. The two methods of drilling wells are

a. electric drilling and water pressure
b. steam drilling and rotary
c. hydraulic rotary and cable-tool percussion
d. percussion and displacement

30. The hydraulic rotary method of drilling is accomplished by

a. jetting
b. rotating with suitable tools
c. hand digging
d. percussion method of drilling

31. Loss of high-pressure water into low-pressure areas is prevented by

a. equalizing the pressures
b. casing
c. a layer of nonporous clay
d. pressure pumping

32. The distinction between well points and screens is

a. too small to make any appreciable difference
b. none
c. in their location
d. highly significant

33. To secure the highest yield the best type of well strainer is

a. a continuous-slot screen
b. a tubular milled screen
c. a screen with graduated openings
d. a screen with small rectangular openings

34. Locating water-bearing beds is aided by a knowledge of

a. chemistry'
b. hydraulics
c. geology
d. astronomy

35. In the cable tool percussion method, what is used to prevent caving in of the hole?

a. air
b. casing
c. depth
d. size of hole

36. The distance between the water level during pumping and the static water level is the

a. draw-down
b. pumping depth
c. fresh water table
d. potable water depth

37. What is static water level in a well?

a. level of draw-down
b. pumping level
c. level or elevation of water in well before pumping
d. pumping head

38. To convert pressure into feet multiply pressure by

a. 3.21
b. 1.23

c. 2.13
d. 2.31

39. An increased draw-down when static level is unchanged indicates

a. an unstable water supply
b. an obstruction in or around the screen
c. increased rainfall
d. a broken air line

40. A sand well can be best cleaned by

a. backwashing and backblowing
b. hand tools
c. drainage
d. gravity flow

EXAMINATION 2

Textbook Assignment: Chapters 3 and 4

---

1. Pump efficiency can be seriously affected by

   a. worn sealing rings
   b. rust around the motor
   c. temperature
   d. loose bolts

2. In determining the efficiency of a pump, all calculations should be

   a. duplicated
   b. accurate to three percent
   c. made on paper
   d. averaged

3. Negative pressure on a gauge represents

   a. pump failure
   b. low atmospheric pressure
   c. suction lift
   d. loss of water

4. Actual power output cannot be measured precisely

   a. on an electrical device
   b. if delivered by an internal combustion engine
   c. by a wattmeter
   d. with a voltmeter

5. Capacity of an electric motor is directly proportional to

   a. age
   b. current
   c. efficiency
   d. speed

6. Static level plus draw-down equals

   a. lift in well
   b. total head
   c. bottom of well
   d. well depth

7. If packing is too tight it will

   a. stop motor
   b. hold excess moisture
   c. smoke when equipment is started
   d. stagger rings

8. A piston pump operates in a

   a. cylinder
   b. emergency
   c. deep well
   d. liquid

9. A delivery per stroke less than 90% indicates possible

   a. pump failure
   b. leakage
   c. lack of oil
   d. faulty wiring

10. A practical way to prevent rust on the exterior of a pump is to

   a. replace pump
   b. use stainless steel for the exterior
   c. cover it with a high grade of watch oil
   d. cover it with a coat of suitable paint

11. In a centrifugal pump pressure depends mainly on

   a. speed of rotation and diameter of the impeller
   b. centrifugal force
   c. atmospheric pressure
   d. strength of impeller

12. Multiple-stage centrifugal pumps are used for

   a. low discharge pressures
   b. high mineral content water
   c. high discharge pressures
   d. extra power

13. A slight leakage of seal water when pumps are running will

    a. cause a larger leak
    b. keep packing cool and in good condition
    c. affect the gauge reading
    d. rust the packing

14. When replacing packing the joints should be

    a. staggered
    b. soldered
    c. loose
    d. airtight

15. If sleeve bearings are running hot

    a. move pump to a cooler location
    b. check for excess lubrication
    c. they are worn out
    d. check for lack of lubricant

16. Before putting oil in the bearing house

    a. allow oil level to drop two inches
    b. close all valves
    c. stop pump shaft from rotating
    d. check for air leakage

17. Keep sheaves in perfect alignment in order to avoid

    a. excessive wear of belt
    b. twisting of pipes
    c. pitting
    d. burning out motor

18. A turbine well pump is

    a. suitable for ground water only
    b. suspended in the well
    c. operated from above the well
    d. operated by vacuum pressure

19. Impeller adjustment on turbine well pump must be recalculated when

    a. pump starts to wear
    b. water level drops
    c. head conditions change
    d. packing begins to leak

20. The average rate of oil feed for oil-lubricated pumps is

    a. three to four drops per second
    b. 60 drops per hour
    c. 6 drops per minute
    d. three to four drops per minute

21. In an air lift pump the column of water and air is forced out by

    a. hydraulic pressure
    b. atmospheric pressure
    c. a pump
    d. gravity

22. Total lift equals

    a. static head plus pumping head
    b. static level plus draw-down
    c. elevation plus static head plus draw-down
    d. pumping head minus draw-down

23. Total length of air line equals

    a. total depth of well
    b. total lift plus submergence
    c. lift plus draw-down
    d. elevation plus submergence

24. Pressure required in an air lift pump depends entirely on

    a. submergence
    b. capacity
    c. total lift
    d. starting pressure

25. Capacity increases as discharge or eduction-pipe diameter is

    a. decreased
    b. lowered
    c. raised
    d. increased

26. Rate of stream flow is usually measured in

    a. cubic feet per second
    b. pounds per square inch

c. gallons per minute
d. gallons per second

27. All meters consist of

a. three separate parts
b. a primary and a secondary element
c. weirs
d. a pressure gauge

28. Weirs are used to measure flow in

a. pipes
b. tanks
c. channels and streams
d. catch basins

29. The V-notch weir is particularly suitable for

a. very low flows
b. very rapid flows
c. high flows
d. large flows

30. The rate of discharge of a 90^{o} triangular weir 5 inches high is

a. 113 gpm
b. 104 gpm
c. 1310 gpm
d. 133 gpm

31. The most successful device for measuring sludges is a

a. V-notch weir
b. Parshall flume
c. Kennison nozzle
d. voltmeter

32. What is the free-flow discharge of a Parshall flume if the head is one foot and the throat width is 6 inches?

a. 2.06 gpm
b. 925 gpm
c. 4.0[illegible] gpm
d. 765 gpm

33. The velocity of water flowing in a restricted pipe increases in direct proportion to the

a. decrease in cross-sectional area
b. length of pipe
c. increase in diameter
d. velocity head

34. A nutating-disk type meter

a. is used for very rapid flows
b. meters by indirect displacement
c. is accurate for very low flows
d. is constantly in danger of corrosion

35. Proportional meters operate on the

a. reduced velocity of water
b. gravity flow principle
c. surface of the water
d. differential pressure produced by an orifice in the line

36. A manometer registers only

a. capacity
b. the velocity head
c. pressure
d. amount of current

37. To clean metering devices use a hog solution of

a. trisodium phosphate
b. zinc chloride
c. ferric chloride
d. magnesium sulfate

38. When preparing an acid solution always

a. add water to acid
b. heat the solution first
c. add acid to water
d. test strength of solution by placing small amount on hand

39. If solids accumulate at weir plate

a. a flood will result
b. the velocity of approach is increased
c. a more accurate measurement can be made
d. water flow will stop

40. The armature face of Chronoflo instruments can be cleaned with

a. carbon tetrachloride
b. ferric chloride
c. copper sulfate
d. zinc arsenate

41. The universal receiver mechanism of a Chronoflo instrument should be oiled with

a. watch oil
b. heavy machine oil
c. typewriter oil
d. clock oil

42. When Flo-Watch meter is operating, totalizer must be completely engaged when

a. current is off
b. cam shoe is off cam
c. reading has been taken
d. cam shoe is on cam

43. Friction disk of the totalizing element of a type-S meter should be

a. oiled frequently
b. kept free from oil
c. stationary
d. disconnected when in use

44. If pointer on the register of a venturi tube remains stationary

a. the line leaks
b. pressure is low
c. the line is tight
d. pressure lines contain air

45. In air-compressor storage tanks, accumulation of condensation will

a. reduce volume of tank and make too frequent operation of the compressor necessary
b. expand tank
c. eliminate need for lubrication
d. make tank capacity larger

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